

CLAIMS

1. (Amended) A model of macrostructural ~~properties~~ characteristics of a bone and interactions of the bone with external force ~~wherein said model comprises~~ comprising at least three orders of hierarchical structural and hierarchical mechanical properties of microstructure of ~~said the bone, and interactions of said bone with external force~~ wherein:
 - a first order comprises at least one macroscopic region of the bone,
 - a second order comprises at least one component representing one or more osteons or lamellae,
 - a third order comprises at least one component representing one or more collagen bundles, hydroxyapatite crystallites, mucopolysaccharides, or combinations thereof,
 - each component is correlated with at least one mechanical property,
 - components of the third order are assembled to provide a description of components of the second order, and
 - components of the second order are assembled to provide a description of one or more characteristics of the first order, including at least one interaction with an external force.
2. (Original) A model as defined in claim 1, wherein ~~said the~~ the bone is compact bone or cancellous bone.
3. (Original) A model as defined in claim 1, wherein ~~said the~~ the mechanical properties are selected from the group consisting of tension, compression, shear, bending, torsion, prestress, pinching, and cement line slippage.

4. (Original) A method of predicting deformation and fractures of bone using the model as defined in claim 1.
5. (Original) A method of identifying the requirements of bone reconstruction and prosthesis using the model as defined in claim 1.
6. (New) The method of claim 4, further comprising comparing the model of macrostructural characteristics of the bone with a subject bone and predicting deformation or fractures of the subject bone based upon the differences in the model of bone and the subject bone.
7. (New) The method of claim 5, further comprising comparing the model of macrostructural characteristics of the bone with a synthetic bone and designing the synthetic bone to have similar hierarchical structure and hierarchical mechanical properties as the model of bone.
8. (New) The method of claim 5, further comprising comparing the model of macrostructural characteristics of the bone with a subject bone to be reconstructed or grafted, and reconstructing or grafting the subject bone based upon the hierarchical structural and mechanical properties of the model of bone.
9. (New) The method of claim 5, further comprising comparing the model of macrostructural characteristics of the bone with a subject bone to receive screws or prostheses, and determining placement of the screws or the prostheses in the subject bone based upon the hierarchical structural and mechanical properties of the model of bone.